

The Utilization of Digital Technology in Learning Quality Management at State Vocational High School

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Abstrak

This research aims to explore the use of digital technology in the management of learning quality at SMK Negeri 1 Plered, with a focus on the implementation of the PDCA (Plan-Do-Check-Act) cycle in improving the quality of education as initiated by Deming and Sallis. The approach used is qualitative with an exploratory case study method, which allows researchers to explore a deep understanding of the application of digital technology in vocational schools. This research was carried out at SMK Negeri 1 Plered, Purwakarta Regency, West Java, with the main data source involving 6 informants, namely the Principal, Deputy Head of Curriculum, teachers, and 3 students. The data collection technique involved in-depth interviews, observations, and documentation, which were analyzed using interactive models from Miles and Huberman by triangulation to ensure the validity of the findings. The results show that the use of digital platforms such as Google Classroom, Canva, and YouTube plays an important role in increasing learning flexibility, student engagement, and 21st century skill development. However, the main challenges faced are the technology skills gap among teachers and students, as well as limited infrastructure. Suggested follow-up includes improved ongoing training for teachers and the provision of more adequate tools to ensure technology-based learning is optimally accessible to all students. This research provides implications for the development of technology-based learning strategies in other vocational schools to improve the quality of education.

Keywords: Management, Quality, Learning, Digital, Vocational High School

Introduction

In the ever-evolving digital era, the application of technology in various sectors of life, including education, has become inevitable. One of the fields of education that requires special attention in the use of technology is the management of learning quality in Vocational High Schools (SMK). Learning quality management is an important part of ensuring that the educational process in vocational schools is not only of quality, but also relevant to the needs of industry and the times. SMK Negeri 1 Plered as one of the vocational education institutions has begun to implement digital technology in order to improve the quality of its learning quality management. The adoption of digital technology can increase the effectiveness of interactions between teachers and students, as well as enable more innovative approaches in learning (Ahmed et al., 2024). With the right implementation of digital tools, teachers can create a more dynamic learning environment.

Digital technology-based quality management is a system that utilizes digital tools and platforms to increase effectiveness, efficiency, and transparency in the education process to achieve optimal learning quality standards. Digital technology plays a role in facilitating access to information and data management in education, thereby supporting the achievement of learning goals in a more efficient and organized way (Yoto et al., 2022). As part of this effort,

SMK Negeri 1 Plered has utilized various digital-based software and applications to monitor and evaluate the learning process in real-time. The implementation of digital technology in learning quality management aims to provide more accurate and fast data in monitoring student competency achievement, as well as make it easier for teachers and school management to design and improve more effective learning strategies (Dittrich et al., 2024).

One of the concepts that can be used in managing the quality of learning at SMK Negeri 1 Plered is the Deming approach or often known as the PDCA cycle (Hayati et al., 2024). This approach focuses on continuous improvement through four steps, namely Plan, Implement, Check, and Act (Larina, 2015). In this context, digital technology plays an important role in accelerating and simplifying every step in the PDCA cycle, from learning planning to evaluating the results obtained.

The digital technology-based learning management system implemented at SMK Negeri 1 Plered allows teachers to design teaching materials and exams more efficiently, as well as provide faster feedback to students (Çetinkaya, 2024). In addition, the use of e-learning platforms such as Google Classroom, Moodle, and Quizizz also makes it easier for students to access teaching materials and interact with teachers and fellow students, creating a more flexible and structured learning process. For example, through Google Classroom, teachers can directly assign assignments, hold online discussions, and evaluate student learning outcomes in real-time. Digital technology also makes it easier to collect and analyze data on student learning outcomes, which is the basis for continuous evaluation and improvement (Bogler & Somech, 2023).

However, the application of technology in learning quality management cannot be separated from challenges, both in terms of human resources and infrastructure. At SMK Negeri 1 Plered, some of the obstacles faced are the lack of technology skills among most educators, limited adequate equipment, and gaps in access and understanding of technology among students. The creation of an environment conducive to the use of digital tools in the classroom is highly dependent on the support of management and teachers' awareness in using the technology (Sefriani et al., 2021). Salynskaya & Yasnitskaya (2022) show that awareness of the need for digital skills must be increased early in the education system so that students can compete in the workforce. To do so, systematic efforts are needed to ensure that all students have equal access to digital learning tools, as well as proper guidance from educators.

This research aims to explore the use of digital technology in optimizing the quality management of learning based on the Deming cycle (PDCA) at SMK Negeri 1 Plered. The main focus of the research is to identify the extent to which digital technologies, such as e-learning platforms (Google Classroom, Moodle, and Quizizz), are able to support the effective implementation of the Plan, Do, Check, and Act stages. In addition, the study also analyzed factors that affect the use of digital technology in schools, including the availability of infrastructure, teacher training, student readiness, and school management support. A deep understanding of these factors is important so that digital technology implementation strategies can be designed appropriately to improve the quality of education in vocational schools. This article will specifically discuss how digital technology is used in each stage of the PDCA cycle, including in documenting, analyzing, and interpreting learning evaluation data accurately and efficiently. With this approach, digital technology is expected to be not only a tool, but also a strategic driving factor in creating a culture of continuous learning quality improvement at SMK Negeri 1 Plered.

Finally, the application of digital technology in learning quality management at SMK Negeri 1 Plered is expected to be an example for other schools in implementing a technology-based approach to ensure optimal learning quality. Thus, learning quality management can not

only meet the set educational standards, but also provide better results for students as prospective workers who are ready to face challenges in the industrial world.

Method

This study uses a qualitative approach with an exploratory case study method. The qualitative approach was chosen because it aims to explore in depth understanding and information about the phenomenon of the use of digital technology in the management of learning quality at SMK Negeri 1 Plered. This approach allows researchers to obtain richer and more comprehensive data, as well as provide a clear picture of the implementation and challenges faced by schools in using digital technology (Creswell & Creswell, 2018; Gu, 2014; Prayitno, 2023; Rozi, 2023). The exploratory case study was chosen because this research aims to explore a situation that is developing and has not been widely researched before (Munawaroh, 2018; Oktariska et al., 2018; Trenggonowati & Kulsum, 2018), especially regarding how digital technology can be integrated in the quality management of learning based on the PDCA cycle in vocational schools. The main objective of this study is to provide an in-depth picture of the conditions in the field, which can provide useful insights for the management of technology-based education in other schools.

This research was carried out at SMK Negeri 1 Plered, Purwakarta Regency, West Java, Indonesia. SMK Negeri 1 Plered was chosen as the location for the research using purposive sampling techniques, considering that this school has actively integrated digital technology in learning quality management and has relevant experience related to its implementation. In addition, SMK Negeri 1 Plered has various excellent programs that involve the intensive use of digital technology in the learning process, so it is considered representative as a typical case that is able to illustrate the dynamics of technology implementation in the context of vocational education. Thus, the selection of this school is expected to make a significant contribution to a deeper understanding of the application of digital technology in the management of learning quality at the Vocational High School (SMK) level.

The data sources in this study consist of several parties who are directly involved in the learning quality management process at SMK Negeri 1 Plered. The selection of informants was carried out purposively based on the criteria of direct involvement, role relevance, and in-depth experience related to the implementation of digital technology in the PDCA cycle in schools. The main informants include the Principal, the Deputy Head of Curriculum, teachers, and students. The Principal and Deputy Head of Curriculum were chosen because they have a comprehensive understanding of digital technology-based learning quality management policies and strategies. Teachers are selected based on their experience in the application of digital technology in the classroom, while students are selected based on active involvement in the digital technology-based learning process. Thus, the results of the research can provide a more complete, rich, and holistic picture of the implementation of digital technology in learning quality management at SMK Negeri 1 Plered.

Data collection was carried out through three main techniques, namely interviews, observations, and documentation (Sitika et al., 2021; Muhammad Taufik et al., 2022). Data collection was carried out through three main techniques, namely interviews, observations, and documentation (Sitika et al., 2021; Muhammad Taufik et al., 2022). Interviews were conducted in depth with the Principal, Deputy Head of Curriculum, several teachers, and students to explore detailed information about the implementation of digital technology in managing the quality of learning, including perceptions, experiences, challenges, and impacts felt by the informants. Observations are carried out directly in the classroom and in various learning activities to get a

real picture of the processes and interactions between students, teachers, and digital technology used, such as the use of Google Classroom, Moodle, or Quizizz platforms in the teaching and learning process. The documentation technique is carried out by collecting various relevant documents, including the Learning Implementation Plan (RPP), school quality report cards, student learning evaluation results, school policies on learning digitalization, reports on the use of e-learning platforms, and other documents related to the implementation and evaluation of the use of digital technology at SMK Negeri 1 Plered. The data collection instrument is specifically designed based on the research objectives so that it is able to produce valid, accurate, and comprehensive data on the use of digital technology in the management of learning quality in the school.

The data analysis in this study uses an interactive analysis model from Miles and Huberman which consists of three main stages, namely data collection, data reduction, and data presentation (Firmansyah et al., 2021; Sittika et al., 2022). The analysis process begins with data collection through interviews, observations, and documentation. The data that has been collected is then analyzed by identifying the main themes that emerge from various sources. Furthermore, the data that has been reduced will be presented in a descriptive form that describes the conditions and experiences found in the field. The validity of the data will be tested using the triangulation technique, which combines the results of various data collection methods (interviews, observations, and documentation) to ensure the consistency and reliability of the findings (Khasanah et al., 2023; Kowitartawatee & Limphaibool, 2022; Liansari et al., 2021). This triangulation is important to improve the validity of research findings and reduce biases that may arise during the research process.

Result

Learning planning

Digital technology-based learning planning at SMK Negeri 1 Plered begins with a needs assessment which includes an assessment of student competencies and the demands of the ever-evolving industrial world. Needs assessment is an important stage in learning planning, because it is able to ensure that the learning materials and strategies prepared are relevant to the real needs of students and industry demands. This needs analysis process aims to identify the skills and knowledge students need to be able to compete optimally in the job market. In this case, it is important to consider the specific needs of the industry that are directly related to the various majors at SMK Negeri 1 Plered, such as information technology, electronics, and automotive. Based on the results of the analysis, teachers and school management collaboratively designed strategic learning with a main focus on mastering digital technology, as well as integrating materials that are always updated to be in line with the latest industry developments. The active involvement of teachers and school management in this process shows that there is a strong strategic collaboration, resulting in more effective, relevant, and oriented learning planning to the needs of the world of work and industry.

Input in lesson planning involves various components, such as teachers, students, classrooms, and existing facilities. Teachers at SMK Negeri 1 Plered have an important role in ensuring that digital technology can be used effectively in the learning process. Therefore, choosing a suitable learning platform is an important step. At SMK Negeri 1 Plered, platforms such as Google Classroom, Canva, and YouTube have been used to support digital-based learning. Google Classroom provides ease of management of teaching materials and communication between teachers and students, while Canva is used to design engaging learning materials, and YouTube is used as a visual learning medium that helps students understand

certain concepts. In addition, Artificial Intelligence (AI)-based technology is used to personalize learning, such as in recommending materials or exercises that are appropriate to the student's ability level.

In the selection of learning approaches and methods, SMK Negeri 1 Plered adopts a method that is tailored to the expected profile of graduates, namely the mastery of practical skills that are relevant and ready to be applied in the world of work. Therefore, the learning approach chosen is Project-Based Learning (PjBL), which effectively supports the development of 21st century skills such as critical thinking, collaboration, communication, and problem-solving. Through this approach, students are not only required to complete projects creatively and innovatively, but also actively discuss, exchange ideas, and work together in teams to achieve learning goals. This method is in line with the needs of today's industry that prioritizes a workforce that is able to work collaboratively and has the ability to solve real problems independently. In this context, the use of digital technology is very important because it supports collaboration between students more efficiently and improves the quality of interaction through digital learning platforms such as Google Classroom and Moodle, making learning more applicative, relevant, and ready to be applied in a real work environment.

The planning of learning strategies at SMK Negeri 1 Plered integrates the use of digital technology with interactive learning methods and based on practicum activities. Technology is used to create a more engaging and well-rounded learning experience. For example, through computer-based simulations or the use of design applications to delve into engineering materials and other skills. In planning learning evaluations, SMK Negeri 1 Plered uses technology to facilitate assessment and provide real-time feedback to students. Digital-based evaluation systems allow teachers to provide more objective and fast assessments, as well as allow students to know their progress firsthand.

However, in planning this technology-based learning, there are several challenges that need to be faced. One of them is the gap in technology skills among teachers and students, as well as the limited adequate infrastructure. While there have been efforts to improve digital skills, there are still some obstacles in terms of ongoing training for teachers and adequate access to devices for all students. In addition, the importance of awareness of the use of technology in learning still needs to be increased, both from the school and the parents of students. Another challenge is the need for careful planning in integrating technology into the existing curriculum, so that technology can truly support learning without interfering with the main goal of education focused on developing student competencies.

Learning Implementation

The implementation of learning at SMK Negeri 1 Plered, which is based on digital technology, involves interactive activities between teachers and students. Teachers play an active role in designing and delivering materials using digital platforms, as well as providing direct guidance to students through media such as Google Classroom, Canva, and YouTube. These activities facilitate more efficient communication between teachers and students, as well as allow for more flexible learning and can be accessed by students at any time. Students, on the other hand, actively participate in learning by accessing teaching materials online, working on assignments given through digital platforms, and collaborating with their peers in group discussions and projects. This allows for more independent and collaborative learning, in accordance with the times.

The learning method applied at SMK Negeri 1 Plered uses digital technology strategically to support project-based (PjBL) and problem-based learning (PBL) approaches. The PjBL approach engages students in real-world projects that are relevant to the industry, allowing them to effectively integrate theory and practice. Digital technology strengthens this method not only

as a medium of learning, but also as a tool that supports the development of skills such as collaboration, communication, creativity, and project management. For example, students use Google Classroom to distribute assignments, manage deadlines, and facilitate communication within teams. The YouTube platform is used to access supporting materials, practical tutorials, and expand students' horizons through real-life examples from the industrial world. Canva helps students hone their creativity in composing engaging and professional presentations. Meanwhile, the PBL method is supported by digital technology through the use of industrial simulation applications and data analysis tools, allowing students to develop critical thinking skills and analyze problems in more depth. Thus, digital technology does not simply support learning methods, but actively strengthens the mastery of essential skills for students in the face of the challenges of the 21st century.

The implementation of this technology-based learning method not only enriches students' learning experience, but also increases their involvement in the learning process. The use of digital platforms facilitates collaboration between students, both in small and large groups, thereby enhancing teamwork skills that are highly valued by the industrial world. Students can work together online to complete assignments or projects, with the help of digital tools that allow them to share information, discuss, and come up with innovative solutions. This project-based learning provides space for students to be more creative and can design products or solutions that are more applicative, according to market needs.

However, the implementation of technology-based learning at SMK Negeri 1 Plered also faces challenges, especially related to uneven technological skills among teachers and students. Although most students have become accustomed to using digital devices, some teachers still need further training in utilizing technology to improve the quality of teaching. In addition, infrastructure limitations, such as the lack of adequate devices for all students, are obstacles in ensuring that all students can access the materials and follow the learning optimally. To address these challenges, further efforts are needed to improve technology training for educators and ensure the availability of adequate tools to support holistic digital learning.

Learning Evaluation

The learning evaluation process at SMK Negeri 1 Plered based on digital technology is carried out continuously and comprehensively by utilizing a learning management system such as Google Classroom. This evaluation includes formative evaluation, which is an assessment that is carried out during the learning process to provide feedback quickly so that students can improve and improve their competence. Summative evaluation, on the other hand, is carried out at the end of the learning period to measure the level of achievement of students' overall competencies. These two types of evaluations are accommodated in a digital system through features such as online assignments, interactive quizzes, digital projects, and learning outcome reports that can be accessed in real-time. Through the use of this technology, teachers are able to provide fast, detailed, and specific feedback, allowing students to immediately make corrections to their learning outcomes. Digital technology also facilitates the collection of evaluation data more accurately and systematically, so that the results of the evaluation can be used as a basis for making strategic decisions related to continuous improvement, both in terms of learning methods and education quality management at SMK Negeri 1 Plered.

The learning outcomes at SMK Negeri 1 Plered showed a significant increase in both output and outcome aspects. In terms of output, students experienced an increase in learning outcomes as seen in the results of exams, assignments, and projects carried out through digital platforms. The application of Project-Based Learning (PjBL) and Problem-Based Learning (PBL) allows students to develop 21st century skills such as collaboration, creativity, and problem-solving that are relevant to the industrial world. Meanwhile, the outcomes achieved include the

development of students' character, including the ability to collaborate, independence, and responsibility. Project- and problem-based learning provides space for students to actively interact in teams, solve real challenges, and take responsibility for their work.

However, despite progress in the implementation of technology-based assessments, challenges remain, especially related to the technology skills gap among teachers and students. Some teachers and students still find it difficult to utilize digital platforms optimally due to limited technical understanding. In addition, limited access to devices such as laptops or smartphones also hinders students' participation in digital learning to the maximum. Therefore, several concrete strategic steps are recommended: first, schools need to hold regular technology training with a peer mentoring approach so that teachers and students can learn from each other and exchange experiences more effectively. Second, schools are advised to establish strategic partnerships with technology companies or industry parties for the procurement of more affordable digital devices through corporate social responsibility (CSR) programs. Third, schools can develop technical support centers or digital helpdesks in the school environment to help students and teachers who experience technical problems on a daily basis. These steps are expected to create a more inclusive, equitable, and effective learning environment in supporting the implementation of digital technology-based evaluation and learning at SMK Negeri 1 Plered.

Learning Follow-up

The follow-up to digital technology-based learning at SMK Negeri 1 Plered is focused on several important aspects that need to be improved, one of which is technology skills for both teachers and students. Based on interviews with teachers and observations on the implementation of technology, it was found that although there are training efforts for teachers, there are still many that need to be improved in the optimal use of technology. In addition, there is a gap in terms of access to adequate devices for all students. For this reason, the school recognizes the need to improve continuous training for teachers, as well as expand the provision of devices that can be accessed by all students to support the digital learning process.

Based on the findings of the document study and interviews, the school has taken various improvement measures to improve the quality of technology-based learning. The school has introduced an intensive training program for teachers to master various digital platforms, such as Google Classroom, Canva, and YouTube, to enrich students' learning experiences. In addition, to overcome the problem of device limitations, the school is trying to improve infrastructure facilities by updating the devices used and increasing accessibility for students. In this case, schools also involve students' parents to support the procurement of the necessary devices for online learning purposes.

Overall, the follow-up of learning at SMK Negeri 1 Plered shows the school's commitment to continue to improve and adapt to technological developments. Although challenges in terms of training and limited equipment still exist, the efforts made by schools and teachers reflect the seriousness of improving the quality of learning. The school also continues to evaluate to ensure that technology is used optimally in supporting the teaching and learning process, as well as paying attention to the development of students' 21st century skills, such as collaboration, creativity, and problem-solving relevant to industry needs.

Discussion

The Utilization of Digital Technology in Learning Quality Management at State Vocational High School 1 Plered adapts the quality cycle of PDCA Deming which includes Plan, Do, Check and Act (Aggarwal, 2020; Deming, 1986; Morgan & Stewart, 2017; W. Edwards Deming, 2000).

The advantage of implementing the Deming quality cycle (PDCA) in learning quality management based on digital technology lies in a systematic structure that supports continuous improvement in the educational process.

In the "Plan" stage, digital technology-based learning planning at SMK Negeri 1 Plered begins with an in-depth analysis of students' learning needs and relevant industry demands, which allows for a clear understanding of the competencies required by students. This analysis is very important to ensure that the curriculum prepared has a high level of relevance to the needs of the world of work (Ali & Nuryani, 2023). This planning process involves selecting the right digital platforms, such as Google Classroom, Canva, YouTube, and AI-based technologies, that support more effective interaction and learning. Google Classroom was chosen for its ease of assignment management and real-time interaction between teachers and students, while Canva and YouTube were chosen because they allow students to access and create creative content relevant to industry needs. The use of AI-based technology aims to provide a more personalized and adaptive learning experience according to students' abilities, so that the learning process becomes more effective and efficient. In addition, the determination of learning methods that are in accordance with the profile of vocational school graduates, such as Project-Based Learning (PjBL) and Problem-Based Learning (PBL), is the main focus to improve students' practical skills.

Collaboration between educators, students, and industry is essential in the planning stage to ensure that the teaching materials prepared stay up to date with the latest developments and strengthen the skills needed in the world of work (Widhanarto et al., 2023). In addition, the learning strategy that is prepared must pay attention to various factors, such as teacher readiness, student needs, classroom conditions, and existing facilities. Learning evaluation is also designed by considering the challenges and opportunities that arise in the implementation of digital technology, so that the learning process can run more effectively and in accordance with the desired educational goals (Rizal et al., 2023).

The implementation of learning at SMK Negeri 1 Plered is in accordance with the planning that has been prepared, where teachers and students are actively involved in the learning process based on digital technology using platforms such as Google Classroom, Canva, YouTube, and AI. Teacher activities include designing teaching materials and guidance through digital platforms, while students are involved independently and collaboratively in accessing materials, completing assignments, and discussing in group projects. The perspective of digital-based learning quality management can be seen from the efficient interaction between teachers and students, which supports more flexible learning and is relevant to industry demands.

Digital technology-based learning processes have significant advantages and disadvantages, especially when using platforms such as Google Classroom, Canva, YouTube, and AI. One of the main advantages is the ability to increase accessibility and flexibility in learning, which is especially beneficial in remote learning situations. Google Classroom, as a Learning Management System (LMS), allows teachers to manage learning materials in a structured manner, provide quick feedback to students, and have easier interactions in a virtual setting (Irviantina et al., 2022; Perry et al., 2007). In addition, YouTube serves as a rich resource, boosting students' motivation to learn by providing engaging and varied content and supporting visual learning styles (Gan et al., 2015; Rustiman, 2023; Thaariq & Syahrta, 2024). The use of these platforms also trains students' digital skills, preparing them for the challenges of the 21st century era. However, it is undeniable that there are weaknesses in the implementation of this technology. Reliance on technology can lead to technical issues that interfere with the learning process, such as unstable internet connections or inadequate devices (Meron, 2021). In addition, there is a risk that students become less socially engaged, reducing the face-to-face

interactions that are important for interpersonal development (Harmin & Faisal, 2023). In the context of YouTube or artificial intelligence, although it is a useful source of information, students may often have difficulty in determining the accuracy and relevance of the information they consume (Afrianto, 2018; Muhamad Taufik, 2020). Therefore, while digital technology-based learning processes offer a variety of benefits, it is important for educators to be aware of the challenges that exist and develop strategies to address those weaknesses for better learning effectiveness.

Effective and efficient digital-based learning evaluation involves the use of digital platforms such as Google Classroom for real-time assessment, rapid feedback, and accurate data analysis. Google Classroom supports formative and summative evaluations with features such as online assignments, quizzes, and regular student progress reports, allowing for more comprehensive monitoring of learning progress. Research shows that its use can improve student learning performance and facilitate a more interactive learning process (Nuryatin et al., 2023). The platform provides a more personalized education, allowing teachers to provide real-time feedback and analyze student performance directly, which positively impacts continuous improvement in the learning process.

In addition, the evaluation features provided by Google Classroom support accurate data collection. This allows educators to track student progress and identify areas that need further attention. D'yab & Alfattah (2023) in their research also explained that the use of Google Classroom contributes significantly to student achievement in certain subjects, which reflects the effectiveness of the platform in supporting learning outcomes. However, the success of this implementation often depends on adequate technology readiness and training for teachers (Saidu & Mamun, 2022). Therefore, to reach their full potential, it is important for educational institutions to provide adequate training and ensure the availability of technological infrastructure that supports digital-based learning.

Digital technology-based learning has been proven to produce outputs in the form of improved student learning outcomes in exams, assignments, and projects, while the outcomes include the development of students' character, such as the ability to collaborate, independence, and responsibility. Digital technology-based learning has proven to be effective in improving student learning outcomes, which is reflected in increased grades on exams, assignments, and projects (Riyanda et al., 2022). The use of digital platforms not only supports learning management but also encourages higher student engagement, which positively impacts their academic performance (Pigozne et al., 2024). In addition to academic outcomes, the outcomes resulting from this approach also include the development of students' character, such as the ability to collaborate, independence, and responsibility. The digitization of the learning process allows students to learn flexibly and independently, which is important in forming a responsible attitude towards their own education (Kumar, 2024). Thus, the integration of technology in education not only serves to improve learning outcomes, but also contributes to the development of essential social and personal competencies of students in an increasingly complex and connected world (Shafa et al., 2023).

Digital technology-based learning at SMK Negeri 1 Plered provides great opportunities in terms of increased accessibility, flexibility, and the development of 21st century skills such as collaboration and creativity through effective digital platforms such as Google Classroom, Canva, and YouTube. However, the challenges faced include the technology skills gap between teachers and students and limited infrastructure that can hinder the provision of sufficient devices for all students. As a follow-up, the school is focusing on improving continuous training for teachers and providing more adequate tools to ensure that technology-based learning is

optimally accessible to all students, while addressing the challenges that arise in the application of digital technology in the classroom.

Digital technology-based learning in Vocational High Schools (SMK) offers various opportunities and challenges that need to be managed optimally so that the results are effective and sustainable. The main opportunity lies in increasing the accessibility of learning materials through various digital platforms such as e-learning and multimedia applications, which enrich the student learning experience (Suleman & Idayanti, 2023; Utama & Fajriani, 2022). In addition, the use of digital technology can significantly develop students' digital skills, as well as build the character of independence and responsibility, because students are encouraged to actively manage learning time, access materials independently, and complete tasks responsibly, in line with the profile of vocational school graduates in the industrial era 4.0 (Cholik, 2023). However, the main challenge is the limited technology skills among teachers and students, as well as the limitations of infrastructure that can hinder the effective implementation of digital learning (Makalew, 2023; Rahma et al., 2023). To overcome this problem, concrete strategies that can be implemented include continuous training programs for teachers to improve technological competence, as well as infrastructure improvements such as the provision of digital devices and stable internet connections in schools (Rahmadani & Kamaluddin, 2023). With this approach, digital learning not only improves academic results, but also strengthens the formation of student character who is independent, responsible, and ready to face the challenges of the world of work.

Conclusion

The use of digital technology in the management of learning quality at SMK Negeri 1 Plered has a positive impact on improving student learning outcomes and developing 21st century skills, such as collaboration, creativity, and independence. The implementation of digital platforms such as Google Classroom, Canva, and YouTube allows teachers to provide quick feedback and support more flexible and interactive learning. However, the study also found significant challenges, such as the technology skills gap between teachers and students and infrastructure limitations that affect the effectiveness of technology use. As a follow-up, the school has made efforts to improve continuous training for teachers and provide more adequate tools to ensure that all students can access technology-based learning optimally. In the long run, further development in teacher training and the provision of sufficient tools will play a major role in addressing these challenges and ensuring that technology-based learning can deliver optimal outcomes for students. Practically, the results of this research can be used as a reference for other schools in designing strategies for the implementation of digital technology more effectively and inclusively.

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